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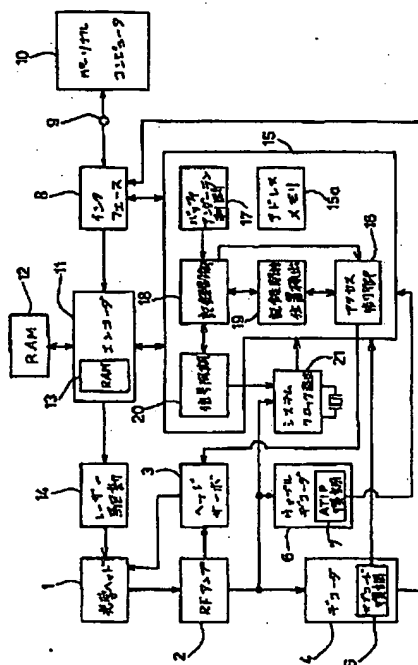
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(54) 【発明の名称】 ディスク記録装置

(57) 【要約】

【課題】 実質的に縦き目無しに連続して記録データを追記することが可能なディスク記録装置を実現するには、記録データの繋ぎ部分の処理が困難であった。

【解決手段】 エンコーダ11による記録データの同期処理をチャンネルビットクロックに同期させて行い、記録開始位置検出手段19により記録開始位置が検出されるまでエンコーダ11にチャンネルビットクロックを供給し、かつ、記録開始位置検出手段19はディスクへの記録中断直前に記憶されるアドレスを参照してディスクに記録済みの記録データの最終フレームのアドレスを判断すると共に、その最終フレームのアドレスが検出された後にフレーム同期信号を検出し、所定のフレーム同期信号を基準にしてチャンネルビットクロックをカウントすることにより記録開始位置を検出する。これにより記録中断直前までにディスクに記録済みの記録データに続く位置から縦き目の発生を防止して追記する。



## PATENT ABSTRACTS OF JAPAN

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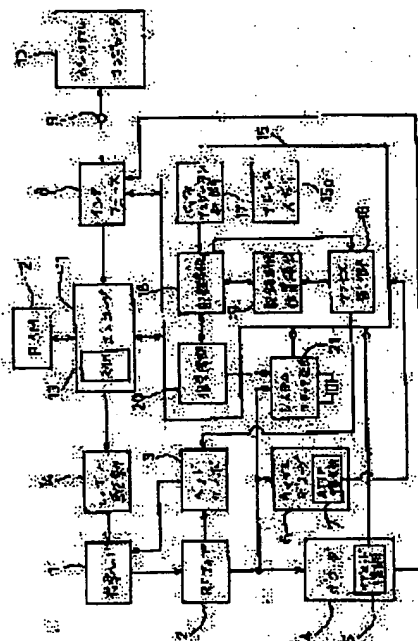
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## (54) DISK RECORDER

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To realize a disk recorder capable of continuously after-writing the recording data with substantially jointless by eliminating the difficulty of processing the link parts of the recording data.

**SOLUTION:** The synchronizing processing of the recording data by an encoder 11 is performed synchronized with a channel bit clock, and the channel bit clock is supplied to the encoder 11 until a recording start position is detected by a recording start position detective means 19, and the recording start position detective means 19 refers to an address stored just before interruption of recording to a disk, and judges the address of the final frame of the recording data recorded to the disk, and detects a frame synchronizing signal after the address of the final frame is detected, and detects the recording start position by counting the channel bit clock based on the prescribed frame synchronizing signal. Thus, the occurrence of the joint is prevented from the position succeeding to the recording data recorded on the disk until just before recording interruption to after-write.



## LEGAL STATUS

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the disk recording apparatus which was made to add a postscript to a disk by securing the continuity of record data especially about the disk recording apparatus which can add record data.

[0002]

[Description of the Prior Art] As a disk recording device which records record data on a disk The optical disk recording device which records on a disk by changing the reflection factor of the recording layer of a disk by irradiating the light beam from an optical head is known. As such an optical disk recording apparatus, the data recorded once are not physically eliminable. The CD-R (Recordable) drive of CD (Compact Disc) family is well known as what dealt with the so-called write-once (write-once) media.

[0003]

[Problem(s) to be Solved by the Invention] CD-R — write-once media [ like ] had a problem of it becoming impossible to use the archive medium, when the buffer under-run to which the data transfer rate of input data becomes late occurred, the record data which this records broke off, the buffer under-run error occurred rather than the data transfer rate which records record data on media, and the file group beforehand written in like Disk at Once (disc at once) or Track AT Once (track at once) was specified.

[0004] The recording rate in a CD-R drive serves as an environment which is easy to generate increasingly in the present condition used as the environment whose opportunity to attain 4X, 8X, and improvement in the speed of standard speed, and operate using a multitasking feature in a personal computer is increasing, and this buffer under-run error poses a problem with a serious buffer under-run error.

[0005] On the other hand, since it is recordable per packet by using a packet-writing method, it can prevent that a buffer under-run error occurs by waiting and recording until the data to record serve as capacity of a packet unit.

[0006] By the way, although the disk recorded by the CD-R drive needed to hold compatibility so that it could reproduce with a CD-ROM drive, it did not restrict [ that the CD-ROM drive makes it not necessarily have corresponded to packet-writing, and ], but had a problem in respect of compatibility.

[0007] Moreover, when recording audio data by the CD-R drive corresponding to CD-DA, a packet-writing method cannot be adopted from the point of compatibility with a CD-DA player.

[0008] Moreover, since packet-writing needed to form the link block for connection between packets, it was disadvantageous also in respect of the storage capacity of a disk.

[0009] Although a disk recording apparatus [ for the reason ] which can add record data without a link block continuously was desired, in order to have realized such a disk recording apparatus, while adding new record data to the disk succeeding record data [ finishing / record ], it needed to be made to synchronize with record data [ finishing / said record ], the postscript needed to be started, and processing of the connector part of record data was difficult.

[0010]

[Means for Solving the Problem] The encoder modulated to the record data with which this invention should record input data on a disk, The record control means which controls record interruption and resumption of record of the record data to a disk, A recording start location detection means to detect the location which follows the termination of the record data recorded by just before record interruption when control of resumption of record was performed by this record control means as a recording start location of a disk, The record data based on an encoder are made to process synchronously in order to make the record data which follow the record data recorded on the disk just before record interruption output from an encoder. A signal synchronous means to synchronize the record data outputted from an encoder with the record data recorded on the disk, The channel bit clock which reproduced record data as a clock of operation used for the motion control of said encoder in case the synchronization of the record data outputted from an encoder with this signal synchronous means is taken is generated. It has the system clock generating circuit which generates the clock for record as said clock of operation when a recording start location is detected by said recording start location detection means. Synchronize synchronous processing of the record data based on an encoder with a channel bit clock, and it is performed. A channel bit clock is supplied to an encoder until a recording start location is detected by said recording start location detection means. And while said recording start location detection means judges the address of the last frame of record data [ finishing / record on a disk ] with reference to the address memorized just before record on a disk is interrupted After the address of the last frame is detected, a frame alignment signal is detected, and he is trying to detect a recording start location by counting a channel bit clock on the basis of a predetermined frame alignment signal.

[0011]

[Example] Drawing 1 is the circuit block diagram showing an example of a CD-R drive as one example of the disk recording apparatus concerning this invention.

[0012] In drawing 1, 1 carries out outgoing radiation of the laser beam which traces a disk. The optical head which performs writing and read-out of record data to a disk, 2 amplifies the RF signal (RF signal) which reads the record data of a disk by this optical head 1, and is obtained. The RF amplifier which makes the RF signal binary and is outputted as digital data, 3 feeds back the output of the optical head 1 through this RF amplifier 2. While performing tracking control which makes the focusing control and the laser beam which make a laser beam focus to the signal side of a disk follow the signal track of a disk, it is the head servo circuit which performs thread delivery control which sends optical head 1 the very thing in the direction of a path of a disk.

[0013] The decoder which performs signal processing which restores to the digital data with which 4 is outputted from RF amplifier 2, and 5 are sub-code demodulator circuits which restore to the separated sub-code.

[0014] 6 is a wobble decoder equipped with the ATIP demodulator circuit 7 which recovers ATIP (Absolute Time In Pre-groove) from a wobble component while it extracts a 22.05kHz wobble (wobble) component from the PURIGURUBU (Pre-groove) signal of the disk obtained through RF amplifier 2 and generates a component required for the roll control of a disk.

[0015] The encoder which modulates the interface which controls delivery of data with the personal computer 10 with which 8 becomes the host connected outside through the connection terminal 9, and the input data into which 11 is inputted through this interface 8 to the record data recorded on a disk, and 12 are RAM for input data which stores the input data modulated by this encoder 11.

[0016] When said encoder 11 performs the modulation based on the specification of CD-ROM, EDC (ErrorDetection Code) of the error detecting code for a sink, a header, and CD-ROM data and ECC (Error Correction Code) of an error correcting code are added to input data. Then, while performing CIRC (the abbreviation for Cross Interleaved Reed-Solomon Code) processing which is the error correcting code of CD method A sub-code is added, and EFM (the abbreviation for Eight to Fourteen Modulation) processing is performed, and a synchronizing signal is added.

[0017] It is a laser drive circuit which drives the laser light source of the optical head 1 so that

Interior RAM and 14 which the encoder 11 interior is equipped with 13 and used for the modulation processing by the encoder 11 may perform record on a disk based on the record data of the EFM data outputted from an encoder 11.

[0018] 15 is a system control circuit which performs system control concerning record and playback of a disk. The sub-code address of the absolute time information in the sub-code (sub Q data) which restored to this system control circuit 15 by the sub-code demodulator circuit 5, And an access-control means 16 to control access alternatively with reference to the ATIP address of the absolute time information in ATIP to which it restored by the ATIP demodulator circuit 7, The data volume currently stored by RAM12 for input data is supervised. A buffer under-run decision means 17 to judge that the condition that it being in the condition the buffer under-run to which the data transfer rate of input data becomes late occurring from the data transfer rate which records record data on a disk, and buffer under-run occurred was avoided, The record control means 18 which controls record of the record data to a disk according to decision by this buffer under-run decision means 17, A recording start location detection means 19 to detect the head of the non-record section where record data are not recorded on a disk, and to detect the recording start location which starts record of record data by said record control means 18, It has a signal synchronous means 20 to synchronize the record data newly recorded on a disk using the sub Q data to which it restores by the synchronizing signal and the sub-code demodulator circuit 5 of a sub-code which are extracted by the decoder 4 with the record data already recorded on the disk.

[0019] 21 is a system clock generating circuit which generates the playback clock which reproduced the EFM data outputted from RF amplifier 2, i.e., the clock of operation used for the system control of operation [ at large ] which starts record and playback of a disk by two PLL (Phase Lock Loop) circuits alternatively synchronized with a channel bit clock and the reference clock of the Xtal oscillation precision.

[0020] Said system clock generating circuit 21 carries out the phase comparison of the channel bit clock and the output of VCO (voltage controlled oscillator)23 which were reproduced by the clock regenerative circuit 22 and extracted with the 1st phase comparator 24, as shown in drawing 2 R> 2. The voltage output generated from this 1st phase comparator 24 according to the phase shift of a channel bit clock and the output of VCO23 is made into direct current voltage by 1st LPF (low pass filter)25. The playback clock system used at the time of the playback actuation constituted by the PLL circuit which returns the direct current voltage to said VCO23 through a switching circuit 26, The phase comparison of the reference clock and the output of VCO23 which are generated by the ridge oscillator 27 is carried out with the 2nd phase comparator 28. The voltage output generated from this 2nd phase comparator 28 according to the phase shift of a reference clock and the output of VCO23 is made into direct current voltage by 2nd LPF29. It has the reference clock system used at the time of the record actuation constituted by the PLL circuit which returns the direct current voltage to said VCO23 through a switching circuit 26.

[0021] Thus, record actuation will be performed, if actuation in which the disk recording apparatus constituted makes a personal computer 10 perform data logging to a disk is performed, the command according to the actuation is generated and the command is recognized by the system control circuit 15 through an interface 8.

[0022] If record actuation is performed, a switching circuit 26 is changed so that a reference clock system may operate with the signal synchronous means 20, the system clock generating circuit 21 will be in the condition of generating a reference clock, and each circuit of drawing 1 will be in the condition of operating synchronizing with a reference clock.

[0023] The optical head 1 is controlled to read the PURIGURUBU signal of a disk by the laser output which performs disk playback, after the PURIGURUBU signal read in the optical head 1 is shaped in waveform by RF amplifier 2, a wobble component is extracted by the wobble decoder 6 and ATIP comes to recover it from the wobble component by the ATIP demodulator circuit 7.

[0024] The data outputted in order to be recorded on a disk from a personal computer 10 are supplied to an encoder 11 through an interface 8, and are modulated by the record data of the gestalt which should be recorded on a disk with this encoder 11.

[0025] If the location traced by the laser beam of the optical head 1 comes to the write-in location of a disk, from an encoder 11, in an EFM frame unit, the sequential output of the record data is carried out, renewal of sequential will be carried out and the address data in which the address corresponding to the outputted record data is shown will be memorized by ADORESUMEMORI 15a provided in the system control circuit 15.

[0026] The laser drive circuit 14 drives the laser light source of the optical head 1 based on the record data outputted from the encoder 11, and, thereby, record on the disk of record data is performed.

[0027] The system clock generating circuit 21 has generated the reference clock at the time of record of a disk, and record of record data is performed at it synchronizing with this reference clock.

[0028] By the way, if the data transfer rate outputted from a personal computer 10 will be in the condition of not catching up with the drawing speed of the record data recorded on a disk and the data transfer rate inputted into an encoder 11 compared with the data transfer rate outputted from an encoder 11 becomes a low speed, the amount of data stored by RAM12 will decrease.

[0029] If the amount of data which will be soon stored by RAM12 if this condition continues becomes empty and this empty occurs, it will judge that the buffer under-run decision means 17 is in the condition which buffer under-run generates, and a decision output to that effect will be generated. Then, a judgment which interrupts record on a disk by the record control means 18 is made, while it is interrupted that record data are outputted from an encoder 11, it is stopped that write in from the optical head 1 and outgoing radiation of the beam is carried out, and record on a disk is interrupted.

[0030] In addition, decision that it is in the condition that the buffer under-run by the buffer under-run decision means 17 is generated is based on the reduction degree of the amount of data currently stored by RAM12, and can also perform that the amount of data currently stored by this RAM12 turned into below the specified quantity.

[0031] Here, if it is interrupted that record data are outputted from an encoder 11, the address data corresponding to the address of the last frame of the record data outputted from the encoder 11 just before record interruption are memorized by address memory 15a in the system control circuit 15, and the address data memorized serve as address information which shows a number of [ the / of the EFM frame in the hour entry and hour entry of the Q channel data (sub Q data) of a sub-code ]. And it has managed the EFM frame [ in / when / at what how many minutes frame / in a hour entry / in / in the address of the record data of the last frame recorded on the disk with the address data memorized by the address memory 15a / sub Q data / the hour entry ] of what position the signal synchronous means 20 is.

[0032] If the following data are inputted from a personal computer 10, the access-control means 16 will be accessed by ATIP which restores to the record data recorded [ by ] on the disk by the ATIP demodulator circuit 7, just before being interrupted, and will start trace by the optical head 1. This trace is started from the predetermined block this side of the address of ATIP corresponding to the address data memorized by for example, address memory 15a.

[0033] If the pit signal formed in the disk by recording record data during this trace is read to coincidence and EFM data come to be obtained from this pit signal The system clock generating circuit 21 is changed from the condition of generating a reference clock with the signal synchronous means 20 to the condition of generating the channel bit clock reproduced from EFM data. It will be in the condition that each circuit of drawing 1 operates synchronizing with the channel bit clock, and will be in the condition that modulation processing by the encoder 11 is also performed synchronizing with a channel bit clock.

[0034] That is, a system clock generating circuit 21 supplies the reference clock which turns into a clock for record as a clock of operation at an encoder 11, if reading of record data [ finishing / record on a disk ] is performed in order processing synchronously the record data based on an encoder 11, is changed to the condition generate a channel bit clock, from the condition generate a reference clock, and will supply a channel bit clock as a clock of operation to an encoder 11 in the condition perform disk record. And the condition that a channel bit clock

is supplied to this encoder 11 as a clock of operation is continued until the output break of an encoder 11 is canceled and record is resumed so that it may mention later.

[0035] Here, the encoder 11 is equipped with the interior RAM 13 for performing modulation processing, and in order that the interior RAM 13 may secure the interleave length (they are a maximum of 108 frames at the EFM frame) of required CIRC to the input data newly inputted, when record of record data is interrupted, data required for CIRC processing are secured.

[0036] If it will be in the condition that modulation processing by the encoder 11 is performed synchronizing with a channel bit clock The synchronization of the record data outputted from an encoder 11 to the record data already recorded on the disk by the signal synchronous means 20 using the sub Q data to which it restores by the synchronizing signal and the sub-code demodulator circuit 5 of a sub-code which are extracted by the decoder 4 is taken. An encoder 11 will be in the standby condition that outputting the record data of degree frame of the last frame recorded on the disk by the record control means 18 with reference to the address data memorized by address memory 15a just before record interruption stands by.

[0037] If an encoder 11 will be in a standby condition, detection of the head location of the non-record section just behind the existing record section where record data are already recorded on the disk by the recording start location detection means 19 with reference to the address data memorized by address memory 15a will be performed.

[0038] Detection of the head location of this non-record section is performed by what position of the EFM frame in the hour entry and hour entry of sub Q data it is. The unit of a sub-code frame (set for EFM frame 98 unit) is searched with sub Q data. An EFM frame unit is searched with a frame alignment signal, and by counting a channel bit clock on the basis of a frame alignment signal, channel bitwise judges the end of the last frame of the record data recorded on the disk, and is performed.

[0039] If detection of the head location of a non-record section is performed, the system clock generating circuit 21 is changed from the condition of generating the channel bit clock which synchronizes with EFM data immediately with the signal synchronous means 20 to the condition of generating a reference clock, and will be in the condition that the reference clock is supplied as a clock of an encoder 11 of operation.

[0040] Here, since the system clock generating circuit 21 is a configuration shown in drawing 2, when a switching circuit 26 is changed, the control voltage which controls VCO23 will change to the electrical potential difference gradually changed for the time constant which 1st LPF25 or 2nd LPF29 has. When a change in the condition of generating a reference clock from the condition of generating a channel bit clock for the reason is performed, the system clock generated from the system clock generating circuit 21 will change from a channel bit clock to a reference clock gradually.

[0041] If it changes from a channel bit clock to the condition that a reference clock is generated, the output break condition of an encoder 11 will be canceled by coincidence by the record control means 18, record data will come to be outputted from an encoder 11, and record on a disk will be resumed.

[0042] In this case, the synchronization with the record data already recorded on the disk by the signal synchronous means 20 and the record data outputted from an encoder 11 is taken, and from an encoder 11, just before record is interrupted, the record data of the following frame recorded [ by ] on the disk are outputted.

[0043] Therefore, while new record data are recorded from the location which continues that there is no joint in the last record data recorded [ by ] on the disk just before record is interrupted, the new record data of the frame following the frame of the last record data are recorded.

[0044] In addition, although it was made to generate a reference clock as a system clock used at the time of record actuation since it was the configuration of having assumed carrying out the roll control of the disk recorded by the constant linear velocity method with the method in an above-mentioned example What is necessary is just to make it generate the clock which synchronized with the wobble component extracted by the wobble decoder 6 as a system clock used at the time of record actuation, when carrying out the roll control of the disk recorded by

the constant linear velocity method by the constant angular velocity method.

[0045]

[Effect of the Invention] Since this invention is performing synchronous processing which synchronizes with record data [ finishing / record on a disk ] the record data outputted from an encoder, and detection of a recording start location using both channel bit clocks as above The condition that the record data which the same clock is used and are rationally outputted from an encoder synchronized with record data [ finishing / record on a disk ] is maintained, synchronize with the detection timing of a recording start location, and the output timing of an encoder is set up. Just before record is interrupted, the record data which prevented generating of a joint from the location following the last record data [ finishing / record on a disk / by ], and secured the continuity can be added.

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**CLAIMS**

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[Claim(s)]

[Claim 1] In the disk recording device with which record data including the address are recorded per frame The encoder which modulates input data to the record data which should be recorded on a disk, The record control means which controls record interruption and resumption of record of the record data to a disk, A recording start location detection means to detect the location which follows the termination of the record data recorded by just before record interruption when control of resumption of record was performed by this record control means as a recording start location of a disk, The record data based on an encoder are made to process synchronously in order to make the record data which follow the record data recorded on the disk just before record interruption output from an encoder. A signal synchronous means to synchronize the record data outputted from an encoder with the record data recorded on the disk, The channel bit clock which reproduced record data as a clock of operation used for the motion control of said encoder in case the synchronization of the record data outputted from an encoder with this signal synchronous means is taken is generated. It has the system clock generating circuit which generates the clock for record as said clock of operation when a recording start location is detected by said recording start location detection means. Synchronize synchronous processing of the record data based on an encoder with a channel bit clock, and it is performed. A channel bit clock is supplied to an encoder until a recording start location is detected by said recording start location detection means. And while said recording start location detection means judges the address of the last frame of record data [ finishing / record on a disk ] with reference to the address memorized just before record on a disk is interrupted The disk recording device characterized by detecting a frame alignment signal after the address of the last frame is detected, and detecting a recording start location by counting a channel bit clock on the basis of a predetermined frame alignment signal.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** It is the circuit block diagram showing an example of a CD-R drive as one example of the disk recording apparatus concerning this invention.

**[Drawing 2]** It is the circuit block diagram showing the concrete configuration of the system clock generating circuit 21.

**[Description of Notations]**

- 1 Optical Head
- 4 Decoder
- 5 Sub-code Demodulator Circuit
- 6 Wobble Decoder
- 8 Interface
- 11 Encoder
- 13 Interior RAM (Memory)
- 14 Laser Drive Circuit
- 15 System Control Circuit
- 16 Access-Control Means
- 17 Buffer Under-run Decision Means
- 18 Record Control Means
- 19 Recording Start Location Detection Means
- 20 Signal Synchronous Means
- 21 System Clock Generating Circuit

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**[Translation done.]**

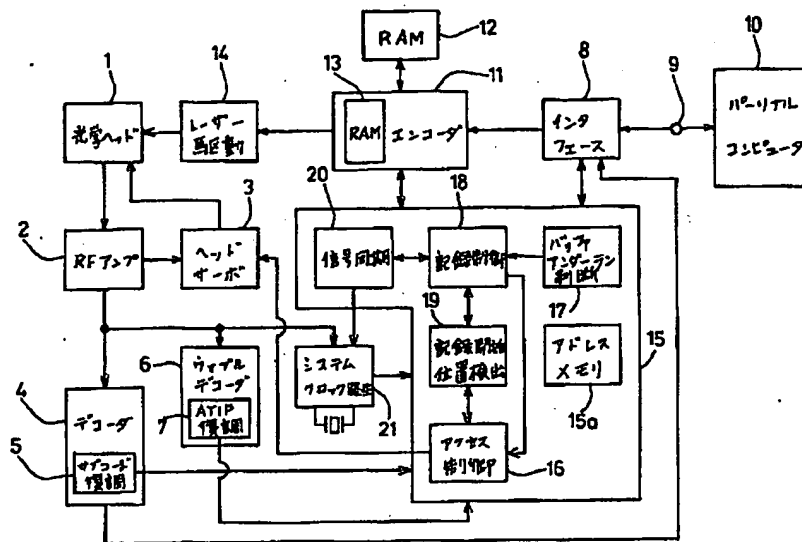
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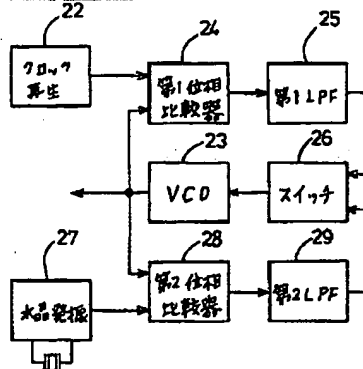
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## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]